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Study on effect of INM on economics of gladiolus (*Gladiolus grandiflorus* L.) cv. American beauty

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Abstract

A field experiment on “Effect of INM on growth and yield of gladiolus cv. American Beauty” was conducted at Floriculture Research Farm, Navsari Agricultural University, Navsari (Gujarat) during the year 2015-16. The experiment was laid out in Randomized Block Design (RBD) with three replications and ten treatments consisting of FYM, bio-fertilizers (*Azotobacter*, PSB and KMB), different levels of inorganic fertilizers and their combinations. The results revealed that application of 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Neuroji* Novel Organic Liquid Fertilizer (T₁₀) was found most effective in number of spikes per hectare (401234.57), number of corms per hectare (404998.38), weight of cormels (2111.67 kg/ha), gross realization (Rs.1272699.42 ha), net realization (Rs. 644435.42/ha) and benefit cost ratio (1: 1.02) in gladiolus cv. American Beauty.

Keywords: Gladiolus, spike, corm, cormel, gross realization, net realization, benefit cost ratio

Introduction

Gladiolus (*Gladiolus grandiflorus* L.) is herbaceous plant belonging to family Iridaceae. It is one of the most important bulbous flower crops grown for its magnificent spike and useful both as cut flower and garden display. For obtaining good quality flowers, nutrition plays an important role and preferably nitrogen and phosphorus has been found more effective in improving vegetative growth of many flowering plants as reported by Bankar and Mukhopadhyay (1985) [2]. Indiscriminate use of chemical fertilizers has caused serious damage to the soil rendering them, often times, saline and less suitable for cultivation. It is therefore, necessary to restrict their use. However, considering recent concept of integrated nutrient management system, which has currently a special significance in crop production to address the sustainability problem and is being practiced in several crops. Integration of bio-fertilizers and organic manures reduces the consumption of inorganic fertilizers and increases the quality and quantity of flowers. Efficacy of the inorganic fertilizers was increased when they are combined with organic manures. Application of farmyard manure (FYM) increased the population of micro-flora mainly *Azotobacter*. The combined application of *Azotobacter* and phosphorus solubilizing bacteria along with chemical fertilizers was found to be most effective in increasing the flower yield of gladiolus. Keeping in view the above facts, this experiment was carried out to study the effect of integrated nutrient management on spike, corm yield and economics of gladiolus cv. American Beauty.

Materials and Methods

The experiment was conducted at Floriculture Research Farm, Navsari Agricultural University, Navsari (Gujarat) during the year 2015-16 on gladiolus cv. American Beauty. The experiment was laid out in Randomized Block Design (RBD) with three replications. The experiment was consisted of ten treatments viz., 100% recommended dose of fertilizers i.e. 200:200:200 kg NPK/ ha (T₁), 50% RDF + FYM @ 15 t/ha (T₂), 75% RDF + FYM @ 7.5 t/ha (T₃), 100% RDF + FYM @ 7.5 t/ha (T₄), 50% RDF + FYM @ 15 t/ha + *Azotobacter* + PSB + KMB (T₅), 75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (T₆), 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (T₇), T₁ + *Azotobacter* + PSB + KMB (T₈), T₁ + 1% foliar spray of *Neuroji* Novel Organic Liquid Fertilizer (T₉), T₇ + 1% foliar spray of *Neuroji* Novel Organic Liquid Fertilizer (T₁₀). Bio-fertilizers (*Azotobacter*, PSB and KMB each @ 2 lit/ha) were mixed well with FYM and applied at the time of land preparation. Half dose of N and full dose P & K was applied after 10 days of planting in each treatment.

Remaining half dose of N and foliar spray of *Nauroji* Novel Organic Liquid Fertilizer was applied after 40 days of planting in each treatment. All the recommended cultural operations were carried out during the course of study. The effect of different treatments was studied and data recorded on flower spike, corm, cormel yield and economics of the crop were calculated and subjected to statistical analysis as suggested by Nigam and Gupta, 1979 [5].

Results and Discussion

Yield

It is evident from Table 1 that the integration of organic manures and bio-fertilizers with inorganic fertilizers showed significant response towards yield attributes and yield of gladiolus cv. American Beauty. The results showed that maximum numbers of spikes per hectare (401234.57), number of corms per hectare (404998.38), weight of cormels (2111.67 kg/ ha) were recorded under treatment T₁₀ i.e. 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer followed by T₇ i.e. 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB and T₆ i.e. 75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB, whereas minimum number of spikes per hectare (283950.62), number of corms per hectare (288332.18), weight of cormels (1395.00 kg/ ha), were recorded in treatment T₁ (100% RDF 200:200:200 NPK kg/ha). Similar results were reported by Kumari Vasantha *et al.* (2014) [4] in gladiolus and Sunitha *et al.* (2007) [6] in marigold.

Flower yield attributes were positively affected by bio-fertilizers like *Azotobacter* which is an associative living diazotroph and has been certified as potential microbial inoculants for increasing the productivity of various crops. These organisms plays role in fixation, synthesizing and secretion of many amino acids, which influence plant growth that ultimately affects the various flower parameters and yield. These findings corroborate with that of Yadav *et al.*

(2005) [8] in tuberose and Basoli *et al.* (2012) [3] in gladiolus. Better corm and cormels production might be due to corms inoculated with bio-fertilizers have stored more carbohydrates through effective photosynthesis. The increase in corms weight might be due to good growth of plant which helps in storage of carbohydrates and nitrogen compounds in the corms. Similar findings have been reported by Baboo and Singh (2006) [1] in gladiolus and Swaminathan *et al.* (1999) [7] in tuberose.

Economics

The net realization in rupees per hectare worked out from number of spikes, corms and weight of cormels per hectare by taking into consideration the prevailing market price of spikes, corms and cormels of gladiolus and inputs used during experiment. The data (Table 1) revealed that the highest number of spikes, corms and weight of cormels per hectare gave maximum net realization (Rs. 644435.42/ha) was recorded in treatment T₁₀ (100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer) which was at par with the treatment T₇ i.e. 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (Rs. 553989.29) and T₆ i.e. 75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (Rs. 519461.13). This clearly indicated that T₁₀, T₇ and T₆ treatments are most beneficial for gladiolus cultivation.

Regarding the benefit cost ratio values worked out, it was revealed that the treatment T₁₀ (100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer) gave the highest benefit cost ratio (1:1.02) which was followed by treatments T₇ i.e. 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (1:0.88) and T₆ i.e. 75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (1:0.83). With respect to the yield of spikes, one can earn more by using less input and reduced the cost of cultivation as per treatment T₇ and T₆ which found at par to T₁₀.

Table 1: Economics of different treatment combinations of INM of gladiolus cv. American Beauty

Treatments	Number of spikes production/ ha	Spikes realization (Rs/ha)	Number of corms/ ha	Corms realization (Rs/ha)	Weight of cormels (kg/ha)	Cormels realization (Rs/ha)	Total investment (Rs/ha)	Gross realization (Rs/ha)	Net realization (Rs/ha)	BCR
T ₁	283950.62	425925.93	288332.18	432498.27	1395.00	41850.00	623069.00	900274.20	277205.20	0.44
T ₂	296296.30	444444.44	299998.80	449998.20	1400.00	42000.00	621857.00	936442.64	314585.64	0.51
T ₃	308641.98	462962.96	316665.40	474998.10	1638.33	49150.00	622463.00	987111.06	364648.06	0.59
T ₄	324074.07	486111.11	328332.02	492498.03	1645.00	49350.00	627344.00	1027959.14	400615.14	0.64
T ₅	341049.38	511574.07	338331.98	507497.97	1666.67	50000.00	622577.00	1069072.04	446495.04	0.72
T ₆	364197.53	546296.30	361665.22	542497.83	1716.67	51500.00	623183.00	1142644.13	519461.13	0.83
T ₇	370370.37	555555.56	378331.82	567497.73	1966.67	59000.00	628064.00	1182053.29	553989.29	0.88
T ₈	333333.33	500000.00	344998.62	517497.93	1721.67	51650.00	623789.00	1069147.93	445358.93	0.71
T ₉	327160.49	490740.74	333332.00	499998.00	1645.00	49350.00	623689.00	1040088.74	416399.74	0.67
T ₁₀	401234.57	601851.85	404998.38	607497.57	2111.67	63350.00	628264.00	1272699.42	644435.42	1.02

Selling price:-

Spike- Rs. 1.5/spike

Corms- Rs. 1.5/ Corm

Cormels- Rs. 30/ kg

Conclusion

As per economics point of view, highest net realization of Rs. 644435.42/ha along with benefit cost ratio of 1: 1.02 was recorded with the treatment T₁₀ (100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer) followed by T₇ i.e. 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (Rs. 553989.29 with CBR 1: 0.88) and T₆ i.e. 75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (Rs.

519461.13 with benefit cost ratio 1: 0.83). This clearly indicated that T₇ and T₆ treatments are also economically viable for gladiolus cultivation besides T₁₀.

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